IN THE CLAIMS

1. (Currently amended) A magnetic bearing device comprising:

a rotary shaft carrying a fan rotating at a variable speed in a chamber holding a variable gas pressure;

a motor rotating said rotary shaft;

a magnetic bearing holding said rotary shaft; and

a control circuit changing a parameter in feedback control performed for holding said rotary shaft in a position allowing stable rotation of said fan, to a numeric value calculated based on ~~in accordance with~~ a load applied to said magnetic bearing.

2. (Original) The magnetic bearing device according to claim 1, wherein

said magnetic bearing includes an electromagnet for holding said rotary shaft in a predetermined position, and

said control circuit detects said load based on a coil current flowing through a coil forming said electromagnet or a coil current instruction, and changes said parameter in accordance with the determined load.

3. (Original) The magnetic bearing device according to claim 2, wherein

said control circuit determines an average of said coil current or said coil current instruction by processing said coil current or said coil current instruction with a low-pass filter, and determines said load based on the determined average, and

a time constant of said low-pass filter is larger than a rotation cycle of said rotary shaft.

4. (Original) The magnetic bearing device according to claim 1, further comprising:

an observer capable of estimation of at least a speed and a stepwise load, wherein

said control circuit includes a state feedback gain,

said observer estimates a state variable by changing a reference model held by said observer itself in accordance with variations in said load, and

said state feedback gain changes said gain based on the state variable estimated by said observer.

5. (Original) The magnetic bearing device according to claim 1, wherein

said control circuit determines said load based on an output of a motor drive device driving said motor, and changes said parameter in accordance with the determined load.

6. (Original) The magnetic bearing device according to claim 1, wherein

said control circuit determines magnitudes of frequency components near a crossover frequency on an open-loop transfer function in said feedback control, increases a gain included in said parameter by a predetermined magnitude in response to increase in magnitude of the frequency component on a low frequency side of said determined frequency components, and decreases said gain by a predetermined magnitude in response to increase in magnitude of the frequency component on a high frequency side of said determined frequency components.

7. (Original) The magnetic bearing device according to claim 6, wherein

said control circuit determines the magnitude of said frequency component by performing convolution calculation on only the target frequency component based on the Fourier transform theory.

8. (Original) The magnetic bearing device according to claim 7, wherein

said control circuit performs said convolution calculation on said frequency component for each control cycle, and

a data length of data subjected to said Fourier transform satisfies a relationship that the data length is equal to a result of multiplication of a cycle at a target frequency by (integer/(control cycle)).

9. (Original) The magnetic bearing device according to claim 1, wherein

said control circuit further controls said magnetic bearing to reduce a change of a control model due to the load applied to said rotary shaft, and changes said parameter based on the control model reduced in change.

10. (Original) The magnetic bearing device according to claim 9, wherein

said magnetic bearing includes a plurality of magnetic bearing pairs,

said control circuit determines a direction of the load applied to said rotary shaft based on a plurality of currents flowing through said plurality of magnetic bearing pairs or a plurality of current instructions, and changes a floating position of said rotary shaft in a direction opposite to the determined direction of the load.

11. (Original) The magnetic bearing device according to claim 10, wherein

said control circuit determines a plurality of forces corresponding to said plurality of magnetic bearing pairs and applied to the respective magnetic bearing pairs, and determines a direction of said load by combining the plurality of determined forces.

12. (Original) The magnetic bearing device according to claim 9, wherein

said magnetic bearing includes a plurality of magnetic bearing pairs, and

said plurality of magnetic bearing pairs are positioned to receive equally a resultant of a load caused by a gravitation of said rotary shaft and a maximum load applied by said fan.

13. (Original) A crossflow fan device for excimer laser comprising:

the magnetic bearing device according to any one of the preceding claims 1 to 12.

14. (Withdrawn) A program for executing a computer to perform feedback control on a magnetic bearing such that a rotary shaft carrying a fan rotating at a variable speed in a chamber holding a variable gas pressure is held in a position allowing stable rotation of said fan, said program executing said computer to execute:

a first step of determining a load applied to said magnetic bearing;

a second step of changing a parameter in said feedback control in accordance with the determined load; and

a third step of performing said feedback control with said changed parameter.

15. (Withdrawn) The program for the computer according to claim 14, wherein

said magnetic bearing includes an electromagnet for holding said rotary shaft in a predetermined position, and

said first step is executed to determine said load based on a coil current flowing through a coil forming said electromagnet or a coil current instruction.

16. (Withdrawn) The program for executing the computer according to claim 15, wherein

said first step is executed to determine an average of said coil current by processing said coil current with a low-pass filter, and to determine said load based on the determined average, and

a time constant of said low-pass filter is larger than a rotation cycle of said rotary shaft.

17. (Withdrawn) The program for the computer according to claim 14, wherein

said second step includes:

a first sub-step of estimating a state variable by an observer capable of estimation of at least a speed and a stepwise load while changing a reference model of said observer in accordance with variations in said load, and

a second sub-step of changing a gain included in said parameter based on the state variable estimated by said observer by a state feedback gain.

18. (Withdrawn) The program for the computer according to claim 14, wherein

said first step is executed to determine said load based on an output of a motor drive device driving a motor driving said rotary shaft.

19. (Withdrawn) The program for the computer according to claim 14, wherein

said first step is executed to determine magnitudes of frequency components near a crossover frequency on an open-loop transfer function in said feedback control, and

said second step is executed to increase a gain included in said parameter by a predetermined magnitude in response to increase in magnitude of the frequency component on a low frequency side of the determined frequency components, and to decrease said gain by a predetermined magnitude in response to increase in magnitude of the frequency component on a high frequency side of the determined frequency components.

20. (Withdrawn) The program for the computer according to claim 19, wherein

said first step is executed to determine said magnitude of the frequency component by performing convolution calculation on only the target frequency component based on the Fourier transform theory.

21. (Withdrawn) The program for the computer according to claim 20, wherein

said first step is executed to perform said convolution calculation on the frequency component for each control cycle based on data having a data length satisfying a relationship that the data length is equal to a result of multiplication of a cycle at a target frequency by (integer/(control cycle)).

22. (Withdrawn) The program for the computer according to claim 14, wherein

said program further operates the computer to execute a fourth step of controlling said magnetic bearing to reduce a change of a control model due to said determined load, and

said second step is executed to change a gain included in said parameter based on the control model reduced in said change.

23. (Withdrawn) The program for the computer according to claim 22, wherein

said magnetic bearing includes a plurality of magnetic bearing pairs, and

said fourth step includes:

a first sub-step of determining a direction of the load applied to said rotary shaft based on a plurality of currents flowing through said plurality of magnetic bearing pairs or a plurality of current instructions, and

a second sub-step of changing a floating position of said rotary shaft in a direction opposite to said determined direction of the load.

24. (Withdrawn) The program for the computer according to claim 23, wherein

said first sub-step includes:

a step of determining a plurality of forces corresponding to said plurality of magnetic bearing pairs and applied to the respective magnetic bearing pairs, and

a step of determining a direction of said load by combining said plurality of determined forces.

25. (Withdrawn) A computer-readable record medium storing a program according to any one of the preceding claims 14 to 24.